PATENT SPECIFICATION

816,285

Date of Application and filing Complete Specification: Jan. 2, 1958.

No. 240/58.

Complete Specification Published: July 8, 1959.

Index at acceptance:—Classes 78(1), S(3G: 10); and 145, B(3: 7).

International Classification:—B27b. B65g.

COMPLETE SPECIFICATION

Manufacture of Constructional Materials from Wood Chips

I, HERMANN GEWECKE, a German citizen, of Rosselstrasse 23, Wiesbaden, Germany, do hereby declare the invention for which I pray that a patent may be granted to me, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The invention relates to the manufacture of constructional materials of wood chips.

It is known that binders may be applied to any kind of wood chips, i.e. those made from wood or like raw materials by cutting, sawing, tearing or like processes, and that the wood chips so treated after they have been scattered in random fashion by dropping may be glued together by means of heated hydraulic presses to constitute slabs of wood chips. The customary wood chips, which in general have greater length than their width and thickness, are then placed preponderantly parallel to the plane of the slab and in regard to their longitudinal dimensions they are scattered uniformly in this plane. After the succeeding gluing under pressure of the chips, wood chip slabs are obtained according to the normal method of which the constructional properties are isotropic in the plane parallel to that of the slab.

Over and above this known state of the art, it is made possible by means of the present invention e.g., by using weak natural wood or pieces of wood produced as waste in industry, to manufacture new valuable materials of wood chips with strength properties which can be made directional as desired.

According to the invention in manufacturing wood chip materials of the kind above referred to, the chips being scattered are guided in their fall so that the maximum dimensions of the chips lie within a prescribed acute angle to the longitudinal axis of the slab to provide a constructional element having greater strength in a direction within the said acute angle than in a direction transverse thereto.

The preferred dimensions of the wood chips lie within the following ranges:—

length taken parallel to the fibre axis of the wood between 15 and 75 mm.

width between 2 and 10 mm.

thickness between 0.1 and 0.5 mm.

In general, the ratio of length to thickness of the chips should be between 1:100 and 1:250.

On the surface of the wood chips produced from any desired kind of wood or a mixture of such kinds, finely distributed binders are applied, particularly solutions of artificial resin binders, if desired with the addition of improving media and wood protection media. The quantity of the binder applied reckoned as solid resin or the like should be about 8 to 15 g. for every 100 g. of kiln dried wood chips.

In contrast to the known state of the art in which there is a randomly distributed arrangement of the glued wood chips in the plane of the slab for the manufacture of the usual wood chip slabs, in the application of the invention the glued longish flat wood chips lie with their wide sides parallel to the base plane of the material to be produced but with their longitudinal axes at a more or less acute angle to each other and to the longitudinal axis of the wood chip material to be produced. The wood chips are moreover arranged in overlapping relationship to each other both longitudinally and laterally.

Such a loosely scattered cake of chips formed in a mould of longish form is condensed by pressure at right angles to the cake of chips and is solidified by the application of heat to the overlapping surfaces of the wood chips.

By means of the invention in contrast to the usual slab products (wood chip slabs) new types of wood chip materials are produced which, according to the magnitude of the orientation angle to the longitudinal direction of the material and to each other and according to the overlap of the wood chips, have a longitudinal strength which may be a greater or less multiple of the transverse strength, this multiple being capable of varia-

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tion during manufacture.

Such wood chip materials may be produced as beams, rafters, planks or masts and may be utilised in those cases in which a preferential strength, particularly bending strength, is required in one direction and therewith a desired smaller strength at an angle or perpendicular to the longitudinal axis of the material. Beyond this the structural elements of the new wood chip materials may be given any desired shape in the course of their manufacture. Moreover by making holes or recesses in the cake of chip materials with holes or other passages, e.g. for structural connections, can be prepared.

It is admittedly known that by gluing together thin layers of wood with the fibres laid parallel to each other, laminated wood or plywood can be produced. In contrast to this, however, the wood chip materials according to the invention are formed of relatively small and thin glued wood chips overlapping longitudinally and laterally, which are obtained in the main from weak natural wood and are mechanically produced. It is further an important recognition of the invention that the extreme case of a parallel arrangement of the wood chips to each other and to the longitudinal direction of the wood chip material is disadvantageous, because in this case the transverse strength of the wood chip material becomes so small that its technical usefulness is considerably reduced.

Also, as is well known, the very slight transverse strength of natural wood represents a great technical drawback which makes itself disturbingly evident by the easy possibility of splitting of the wood in the longitudinal direction or by the breaking of the wood when loaded at an angle or across the longitudinal direction of the wood fibres.

By means of the invention, this defect is overcome by arranging the wood chips not parallel to each other and to the longitudinal direction of the wood chip material, but by setting them at a variable chosen acute angle about the longitudinal axis of the wood chip material. Thereby the wood chip materials of the present invention obtain in addition to a preponderant longitudinal strength an angular or transverse strength selected as desired, which ensures a substantially better utility of the wood chip materials than with a completely parallel placing of the chips.

By varying the magnitude of the angle at which the wood chips are scattered, the ratio of the preferred longitudinal strength to the angular or transverse strength may be varied according to technical requirements. In general an angle of 10° to 20° is preferred, but an angle of 15° to 20° has been found the most advantageous.

The arrangement and the adjustable orientation of the wood chips in the manufacture of the wood chip materials of the invention can be effected by suitable arrangements such, for example, as by the use of guide channels, vibrating devices, air currents, magnetic or electrostatic fields and the like.

The preparation of the wood chip material of the invention can be effected in limited dimensions individually or also continuously with the use of continuously operating devices, in which case the heating for glueing the wood chips can be produced by high frequency alternating fields.

The accompanying drawing illustrates the invention, and therein:

Fig. 1 shows an arrangement for distributing the chips on to a moving mould.

Figs. 2 and 3 are plan views of the material before pressing shown with the chips at two different angles.

An example of the manufacture according to the invention will now be described with reference to the drawing.

Waste beech veneer chips about 2 to 3 mm. thick produced in wood working ships, which at present serve mostly as fuel, are cut by machine parallel to the fibre axis of the veneer and at right angles to the plane of the veneer into chips of 2 to 3 mm. width. The chips are dried and glued. From a hopper the glued wood chips are transferred in constant weight distribution to a scattering machine from which they fall in uniform distribution constant in weight and separated into individual chips in the direction of the dotted arrow shown in Fig. 1.

They fall into a tapered box *a* subdivided by partitions into orienting compartments *b* which taper to match the taper of the box *a*, the spacing of the partitions at their top ends being at least as great as the length of the chips and their spacing at their bottom ends being less than said length to ensure the desired orientation of the chips. The tapering compartments orient the chips in the horizontal plane, since the width of each compartment is less than the length of the chips. The compartments *b* are open at the parallel lower ends *c*, and the chips fall therefrom into a box mould *d*, which is lined with sheet metal. At the commencement of discharge the outlet opening of the box is about 7 mm. above the bottom of the mould *d*.

As the chips fall on to the mould floor they are distributed over an angle of 15° to the longitudinal axis of the mould and form with this orientation a layer of wood chips on the forwardly moving mould. Then another layer is formed in a similar manner while the mould is gradually moved back in the opposite direction, and this process is repeated as indicated by the double-headed arrow, until the thickness of the layer of chips is such that the required thickness of the finished piece will be formed. After each passage of the mould the latter is lowered a little to allow the appropriate length of fall on to the previously de-

posited layer of chips. In this particular example a total of 350 g. of chips is distributed over each 100 sq. cm. of the mould base.

After the distribution of the chips is completed, the mould is removed and the material in the mould is condensed in a heated hydraulic press to such an extent that the material weighs 0.78 g. per sq. cm. and thus the thickness of the material amounts to 45 mm. In this condition the high frequency heating of the hydraulic press glues the wood chips together. The wood chip material so produced has a bending strength in the longitudinal direction of 750 kg. per sq. cm. and in the transverse direction one of 190 kg. per sq. cm. The longitudinal strength is then four times the transverse strength. Fig. 2 shows diagrammatically the chips arranged at a distribution angle of 15°.

By the use of orienting arrangements with wider or narrower directing channels, which can be achieved, for example, by means of interchangeable partitions, or with orienting channels of the same width by varying the length of the chips, the scattering angle and therewith the ratio of longitudinal to transverse strength can be varied. For instance the arrangement may be as shown in Fig. 3, in which the angle of spread is about 24°, by restricting the number of orienting compartments *b*. Thereby a material is obtained with a longitudinal bending strength of 680 kg. per sq. cm. and a transverse strength of 230 kg. per sq. cm. The longitudinal strength is, in this case, about three times the transverse strength.

In both cases, a material is obtained from beech waste with a longitudinal strength equal or even superior to that of good deal, and at the same time a transverse strength is obtained which considerably exceeds that of deal.

WHAT I CLAIM IS:—

1. The method of manufacturing constructional materials from wood chips and binder by scattering the mixed chips and binder into a mould and then pressing the cake so formed and causing or allowing the binder to set, in which the chips being scattered are guided in their fall so that the maximum dimensions of the chips lie within a prescribed acute angle to the longitudinal axis of the cake to provide a constructional element having greater strength in a direction within the said acute angle than in a direction transverse thereto.

2. The method as claimed in claim 1, in which the acute angle can be adjusted during manufacture to provide a prescribed ratio between longitudinal and transverse strength.

3. The method as claimed in claim 1 or 2, in which the value of the acute angle is between 10° and 20°.

4. The method as claimed in any of claims 1, 2 and 3, in which the chips are between 15 and 75 mm. long, between 2 and 10 mm. wide, between 0.1 and 0.5 mm. thick, and having a ratio of thickness to length between 1:100 and 1:250.

5. The method as claimed in any of the foregoing claims, in which the guiding of the chips into the desired orientation is effected by mechanical guiding.

6. The method as claimed in any of claims 1 to 4, in which the guiding of the chips into the desired orientation is effected by an air current or by an electrostatic or magnetic field, the adjustment of the acute angle being effected by varying the guiding force.

7. Mechanism for carrying out the method claimed in claim 5, including a moving mould to receive the chips and a tapered box thereabove having partitions parallel to the direction of movement of the mould, the spacing of the partitions at their top ends being at least as great as the length of the chips and their spacing at their bottom ends being less than the said length to ensure the orientation of the chips within the desired angular range.

8. Mechanism as claimed in claim 7, in which interchangeable partitions are provided so as to give different angular ranges in the orientation of the chips.

9. The method of manufacturing constructional materials from wood chips and a binder substantially as described herein with reference to the example.

CARPMAELS & RANSFORD,
Agents for Applicant,
24, Southampton Buildings, Chancery Lane,
London, W.C.2.

Leamington Spa: Printed for Her Majesty's Stationery Office, by the Courier Press.—1959.
Published by The Patent Office, 25, Southampton Buildings, London, W.C.2, from which copies may be obtained.

816,285 COMPLETE SPECIFICATION
1 SHEET

This drawing is a reproduction of the Original on a reduced scale.

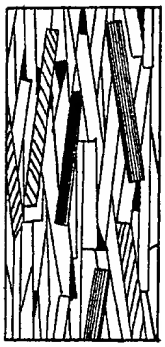

Fig. 2.

Fig. 3.

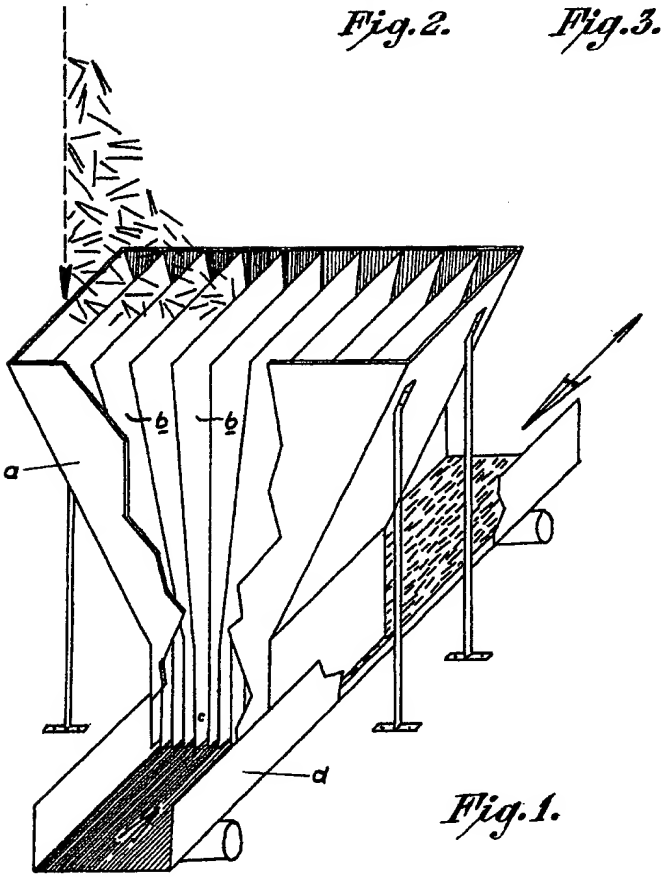

Fig. 1.